

Remarks

Claims 1-61 are pending and under consideration in the application. Applicants note with appreciation the withdrawal of the restriction requirement.

Rejections under 35 USC §103

Claims 1-61 are rejected under 35 USC §103(a) in view of Shibamoto, U.S. Patent No. 5,672,810. Applicants traverse this rejection and respectfully request reconsideration.

The present invention is directed to a high pressure liquid chromatography system, and in particular one which will function at very high pressures, well above the pressure ranges used in a typical HPLC system, which are around 4,000 psi. As noted in the specification, at higher pressures, such as pressures over 6,000 psi, the injection valves used in standard HPLC systems tend to fail. The claimed invention overcomes this problem.

The Shibamoto patent is directed to gas chromatography, not liquid chromatography. In gas chromatography, volatile compounds are injected into an injection chamber or port where they are vaporized (the injection chamber is heated to the boiling point of the compounds of interest in the sample), carried through a separation column by means of a gas mobile phase, and then detected/analyzed by a detector. After a sample is injected into the port, it is held in a "pre-column" area, filled with packing material, while it is vaporized. As would be understood by one skilled in the art, a gas system is of limited relevance to a liquid system, due to numerous differences between the two systems, such as the composition of the mobile phase, pressure and temperature, to name just a few. In particular, due to the use of a septum for injection of the

sample, a gas system cannot be adapted for use in a high pressure system such as HPLC.

It is asserted on page 2 of the office action that Shibamoto teaches all elements of claims 1, 37 and 44, with the exception of a waste receptacle. Applicants respectfully disagree with this assertion. Specifically, the injection port of Shibamoto does not disclose, or remotely suggest, inlet or exit conduits received by inlet or exit openings.

Claim 1 reads as follows:

1. A device for impelling one or more fluids through an exit conduit comprising:

a housing having a chamber for receiving and/or holding one or more fluids under pressure and an exterior surface, and said housing having at least a first exit opening, a first inlet opening, a second exit opening, and a second inlet opening, each opening extending from said chamber to said exterior surface for receiving conduit means;

a first exit conduit means received by said first exit opening in communication with said chamber for transporting fluids from said chamber out of said first exit opening, said first exit conduit means for connection with an analytical device;

a first inlet conduit means received by said first inlet opening in communication with said chamber for transporting a first fluid into said chamber, said first inlet conduit means for connection to a first supply device;

a second inlet conduit means received by said second inlet opening in communication with said chamber for transporting a second fluid into said chamber, said second inlet means for connection with a second supply device;

a second exit conduit means received by said second exit opening in communication with said chamber for transporting fluids from said chamber out of said second exit opening, said second exit conduit means for connection with a waste receptacle;

and at least one valve means disposed in at least one of said first exit conduit means, said second exit conduit means and said second inlet conduit means, said valve means having a closed position wherein fluid is prevented from flowing through said valve means and an open position wherein said fluid is allowed to flow through said valve means, said valve means responsive to a signal to assume one of said positions;

wherein said chamber is for receiving fluid from each of said first inlet conduit means and said second inlet conduit means, and for discharging fluid through said first exit conduit means and said second exit conduit means.

As is apparent from the plain language of Claim 1 and the accompanying figures, the first exit conduit and the first exit opening are separate claim elements and separate structural elements as well, as is indicated by the "received by" language. The same is true for the second exit conduit and the first and second inlet conduits; all are separate elements from their respective exit or inlet openings, and are received by the opening. This aspect of the invention is illustrated, for example, in Figure 7B, which shows the conduit **268** extending from the exterior of the housing

through the opening into the interior of the housing. This aspect is also visible in the other drawings. The use of tubing in the inlet and outlet openings permits use of fittings and other hardware that are specifically adapted for high pressure operation.

In contrast, in the Shibamoto system, the conduits are co-extensive with the openings in interior walls of the port (except in the case of the septum through which the samples are injected). There is no separate structural part corresponding to a conduit in, or "received by" each opening. With regard to the septum in particular, Applicants disagree that this structure in Shibamoto can in any way be characterized as "an inlet opening in communication with said chamber, and an inlet conduit means for connection to a supply device". As explained above, a septum cannot be used in a high pressure system. In any event, the injection port of Shibamoto is structurally (and functionally) distinct from the system of the present invention; there are no structural elements in Shibamoto corresponding to the inlet and exit conduits of the claimed invention, and fluids do not move through the device in the same manner as in the present invention. Therefore, Shibamoto cannot be said to show every aspect of Claim 1 with the exception of the waste receptacle. Shibamoto does not teach or suggest Claim 1, nor any of the claims depending from Claim 1.

Claims 37 and 44 are included in the language of the rejection on page 2 of the office action. Claim 37 specifies that the chamber has a cylindrical wall, and depends from Claim 33, directed to a device further comprising a vent opening. Claim 33 in turn depends from Claim 31, directed to a device having at least one fitting disposed between an opening and its associated conduit means, which in turn depends from Claim 1. As noted above, Shibamoto does not teach or suggest at least several elements of Claim 1. Additionally, Claim 31 contains the added

limitation of a fitting means. It is conceded at page 6 of the office action that Shibamoto does not teach this element either, but it is asserted to be obvious to use fittings in high pressure chromatography systems to prevent leakage. This logic is problematic: if a gas system is asserted to be representative of liquid high pressure systems, and is therefore relevant prior art, why would one skilled in the art find the need for a fitting, based on the teachings of Shibamoto, when the so-called “high pressure” system of Shibamoto does not require them? The office action does not provide any rationale for the addition of a fitting.

In fact, a gas system is not representative of a high pressure liquid system; the gas comes into the system at a pressure between 10 and 200 psi. This is a much lower pressure than the pressures used in high pressure liquid chromatography, and in the present invention. Applicants respectfully submit that Claims 31, 33 and 37 are not obvious in view of the teachings of Shibamoto.

Claim 44 is an independent method claim which contains all of the limitations of Claim 1, with additional language directed to the flow of fluids through the device. Therefore, the statements above regarding non-obviousness of Claim 1 are applicable to Claim 44: Shibamoto does not teach a device with the structural features, and the functionality of, the device claimed in Claim 44, nor is there any suggestion in Shibamoto to modify the device disclosed in that patent to somehow arrive at the device and method of Claim 44.

Based on the above noted differences in the claimed invention and the teachings of Shibamoto, Applicants respectfully submit that Claims 1 and 44, and all dependent claims, are not obvious in view of Shibamoto. Applicants would like to point out features of certain additional dependent claims which also cannot be considered obvious in view of the

cited patent.

Claims 10, 20, 21, 24-27, 32, 45 and 50 are directed to the claimed device wherein the system, including pumps, valves and fittings, is operable at, and retains a chamber pressure of, up to 120,000 psi. It is asserted in the office action that these high pressures "are known in the art of high pressure chromatography". No citation to any reference is provided showing use of these pressures, nor is there any citation to a known liquid chromatography device that operates at these very high pressures. As noted above, a gas chromatography system does not operate in this high pressure range. Thus there is no teaching or suggestion cited anywhere that would lead one of skill to modify the components of the Shibamoto system, or to the selection of the particular features of the device of the invention for overcoming leakage problems in a high pressure system.

Regarding Claims 2 and 61, directed to a freeze-thaw valve, Shibamoto does not remotely teach a valve on a supply line having freeze-thaw capability. The entire chamber of Shibamoto is heated with a coil **41** to vaporize the liquid sample before it moves through the column in the mobile phase; temperature is not used to control the position of any valves. This has nothing to do with a valve having an open/shut position that is controlled by temperature.

Regarding Claims 14, 15, 17-19, 46, 47, 49, 50, 52 and 58-61, discussed in paragraph 24 of the office action on page 5, it is conceded that Shibamoto does not teach any of the features of these claims, which are directed to the control signals which govern the flow of fluid through the device. However, no rationale for their rejection is provided. Applicants respectfully request additional information regarding the nature of the objection to these claims.

Finally, with respect to Claims 28, 29 and 30, discussed at paragraph 30 page 6, it is conceded that Shibamoto does not disclose a valve on a second exit conduit means. It is asserted to be obvious to include a second valve, because “valves are known”. However, there is no rationale provided to support the assertion that it would obvious to add an additional valve, nor any citation to a reference showing use of multiple valves in a comparable device.

Applicants respectfully submit that in view of the numerous differences between the device of Shibamoto and the claimed invention, Claims 1-61 cannot be considered obvious in view of this reference. Withdrawal of the §103 rejection is respectfully requested.

Conclusion

Applicants submit that all outstanding issues have been addressed, and that Claims 1-61 are in condition for allowance. A Notice of Allowance is respectfully requested at an early date.

Respectfully submitted,

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